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true *Felis* by the round form of its pupils. This can only be observed in the living species, so that some correlated index of it must be used in determining the genus from skulls. This Dr. Gray shows is seen in the small size of the orbits, which are always less than those of the species of *Felis*.

Fragmentary remains from the Loup Fork formation of Nebraska and the Pliocene and Quaternary of Mississippi and California have been described by Leidy under the names of *Felis augustus*, *F. atrox* and *F. imperialis*. Dr. Leidy suggests that there may have been two species, the one (*F. augustus*) characteristic of the Loup Fork epoch, and *F. atrox*, the second, belonging to a later period. The *Uncia augusta* was intermediate in size between the *U. onca* and the tiger, while the *Uncia atrox* was, according to Leidy, larger than the lion or tiger. It represents in America the *Uncia spelea* of the European caves, and should be carefully compared with that species.

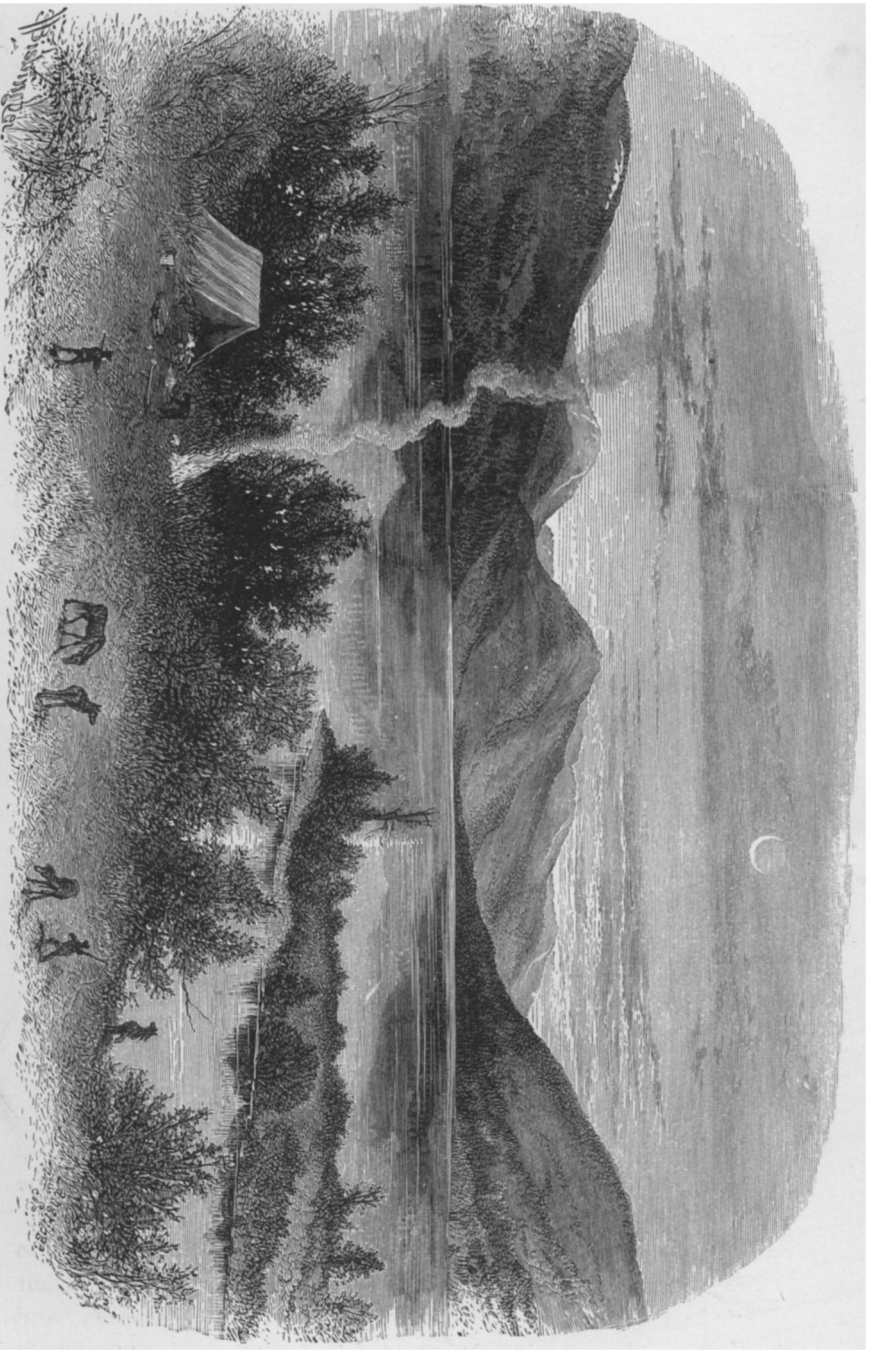
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TWIN LAKES AND TEOCALLI MOUNTAIN, CENTRAL COLORADO, WITH REMARKS ON THE GLACIAL PHENOMENA OF THAT REGION.

BY F. V. HAYDEN.

ONE of the most interesting localities in Central Colorado, is the Twin lakes. These lakes are situated at the point where Lake Fork issues from the Sierra Madre, or Wasatch range, into the short valley which opens into the Upper Arkansas. At no distant period this point, with its surroundings, will form one of the most popular and desirable watering places in the West; already every available spot in the vicinity has been purchased for the purpose of erecting summer houses. The elevation of the lakes is 9357 feet above sea level. Some of the loftiest peaks in Colorado are in full view of the surrounding hills. Massive mountain, Mt. Elbert, Harvard, Yale and Princeton peaks, rise to heights of over 14,000 feet. The massive granite mountains on every side, are among the most rugged and picturesque in the Rocky Mountain region.

During the survey of this region in 1873, under the direction of the writer, these lakes were carefully sounded, and their greatest depths were found to be respectively seventy and seventy-six feet. These are formed in basins, as it were, which

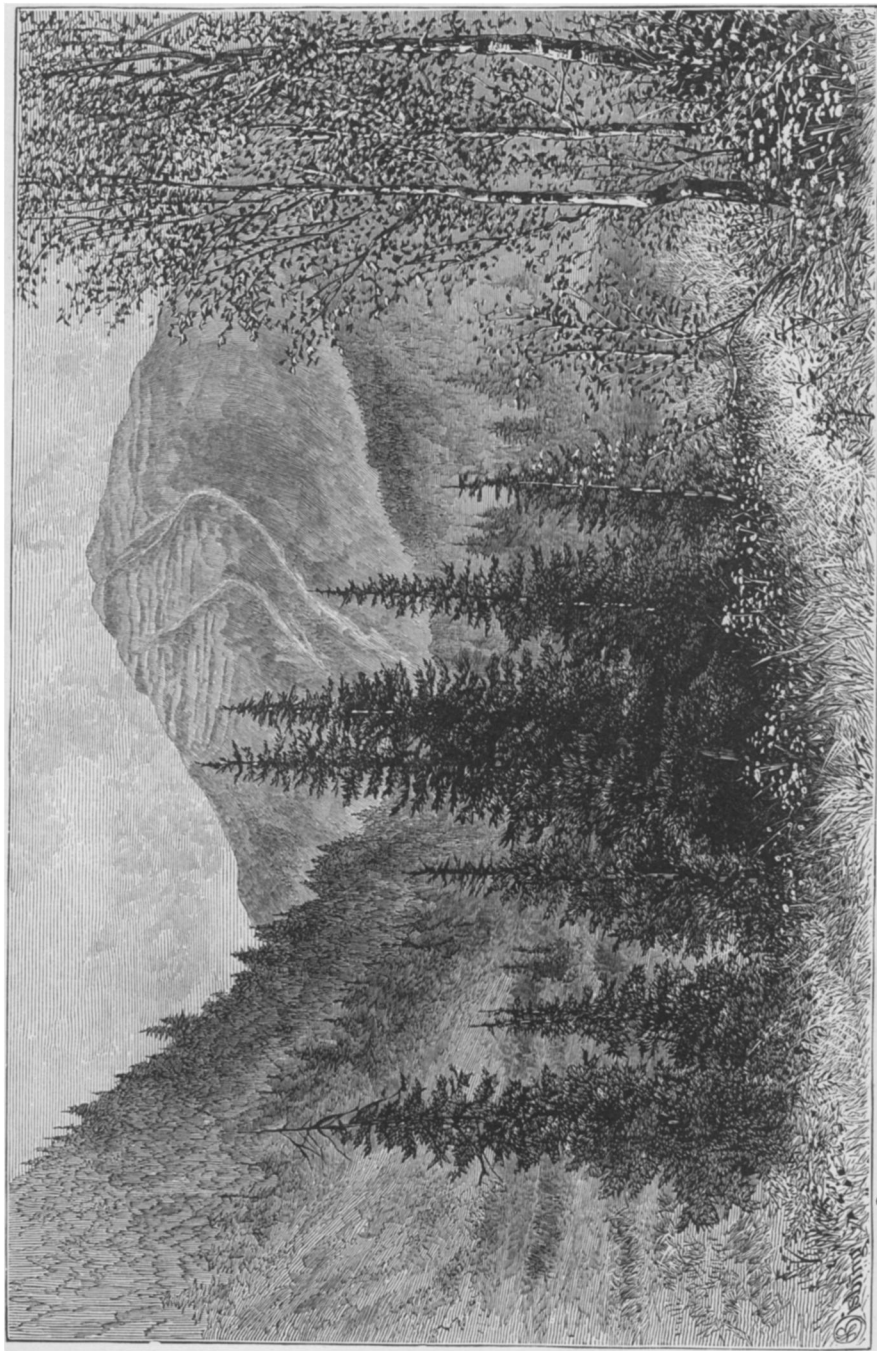


Upper Twin Lake, Central Colorado.

were undoubtedly scooped or worn out of the granite rocks by glacial action. They afford a splendid example of what Prof. Ramsay, the eminent geologist of England, calls "Rock Basins," the origin of which he has so graphically explained in his volume on the "Physical Geography and Geology of Great Britain." In the Upper Arkansas valley there seems to have existed in glacial times, one immense glacier, rising to the height of 1000 to 1500 feet on the mountain sides, and filling up the entire valley, with tongues or branches extending up the numerous side cañons. A description of this remarkable district may be condensed from the Report of the U. S. Geol. and Geog. Survey of the Territories for 1873 and 1874. The Arkansas valley, from its head in Tennessee pass to the point where the river cuts through the Front or Colorado range and opens out into the plains, has been worn out of the granite mass to a great extent. The origin of this valley is mostly due to erosion. From the crest of the Park range, on the east side of the Arkansas river, to that of the Wasatch on the west, the average distance in a straight line must be at least ten or fifteen miles, and the average elevation above the water level of the river 1500 feet. It is probable that this great space was, at no very ancient period, filled with one vast glacier, which doubtless performed the greater part of the grinding up of the rocks and the wearing out of the valley. The glacier-worn sides of the gorges, point strongly to that conclusion.

But in this brief article we must confine ourselves mostly to the limited district, the valley of Lake Fork, in which the Twin lakes are located, the subject of the illustration. The valley of Lake creek is filled with the morainal deposits for which both sides of the Wasatch range of mountains are so remarkable. It would seem that the great glacial force moved here in a direction a little south of east, inasmuch as the mass of the detrital matter is heaped up on the south side. The two lakes are about three hundred and fifty yards apart, with a small stream flowing from the upper into the lower, about twenty feet in width. The interval is made up of worn detrital matter, but over it and around both lakes, are mounds or oblong ridges of drift; and scattered over the surface, are masses of granite, coarse in texture, with crystals of feldspar, one and two inches in diameter, aggregated together. The rock has the appearance of a feldspathic breccia. The lower lake is about two and a-half miles in length

and one and a-half miles in width, the upper lake is one mile in length and a-half mile in width. As we have stated before, the greatest depth was found to be seventy to seventy-six feet. The Lake creek rises about twelve or fifteen miles away, at the crest of the Wasatch range, and flows through a deep gorge or cañon, with signs of glacial erosion its entire length, and as it issues from the mountains into the main valley, has become a considerable stream. These lakes are really expansions or basins in this stream and a part of it. That these lakes have been slowly diminishing in area, we know by the land bordering on both of them. Above the Upper Twin lake, there is a half mile in width of boggy meadow, which at no distant period must have been covered by the lake. At the head of the valley, or where the gorge begins, there is a sort of natural bridge, where the stream has worn a narrow channel through the rocks. At the summit the gorge is about eight feet wide, and in it a huge boulder has lodged. The stream rushes down its steep, narrow, winding channel with great force. On the north side there is a huge boulder just ready to topple off into the channel, which is fifty feet in diameter. On the sides of the channel are several most remarkable rounded cavities worn in, like pot holes, six to ten feet in diameter. One of these occurs twenty feet above the water level of the creek at the present time. The worn rocks, or *roches moutonnes*, are most admirably shown everywhere, and portions crop out in the bottom of the valley to indicate the force as well as the extent of the erosion. It is quite possible that if all the *débris* could be stripped off the gorge and valley, the grooved or scratched surfaces would be apparent. One immense mountain mass on the north side seems to have resisted the eroding forces, so that from base to summit, a height of one thousand feet, it is smooth, like enamel. The great glacier which must have filled up the channel, has probably been obstructed, in its slow downward movement, by this projecting point of the mountain. The great branch glaciers of Lake creek must have been at least 1500 feet thick. The valley or gorge is of nearly uniform width, about one-fourth of a mile, and the glacier must have ploughed its way along, removing a great thickness of the gneissic rocks on either side and on the bottom, rounded remnants of which can be seen cropping everywhere from the detritus. About six miles above Twin lakes, in a straight line, Lake creek forks, one branch extending up toward the north-west, and the other south-west.



Teocalli Mountain, Central Colorado.

Both separate again soon into a number of smaller branches, which end in amphitheaters near the crest. There is not space here to dwell in detail on the remarkable features of this region. The student will find here the most wonderful examples of erosion, and an almost unlimited view of varied glacial phenomena; the lover of sport can find abundant trout fishing in the lakes and various kinds of game in the mountains; the invalid, pure air and water, so that at no distant period the region about Twin lakes must become a famous resort for seekers after health and pleasure.

Teocalli mountain.—On the west side of the Main or Wasatch range, in a nearly direct line from the Twin lakes, is a mountain peak of very singular but interesting appearance. This peak forms the subject of our second illustration. The name was given this peak by the Survey on account of its resemblance to the celebrated sacrificial mound of Mexico. The mass of rock seems to have been elevated by forces acting in a vertical manner so that the strata are nearly or quite horizontal, yet its summit is 13,131 feet above sea level. The peculiar form is pyramidal and the strata of various colored sandstone and clays are so arranged as to form a series of steps from base to summit. The texture of the rocks is quite varied, from a fine sandstone or quartzite to a conglomerate interlaid with thin seams of clay, which is weathered out so as to permit the harder beds to project out like steps. There is an enormous thickness of these variegated beds, and while a great portion may be of the age of the Jura-trias, the lower portion is believed to belong to the era of the Permian, or Permo-carboniferous. From this point can be seen distinctly the remarkably picturesque forms of Pyramid, Maroon and other mountains, rising to an elevation of over 14,000 feet, yet composed of nearly horizontal beds of these variegated rocks. The prevailing color is a dull red or purple. Maroon peak, 14,003 feet above sea level, receives its name from its prevailing color. Great numbers of these peaks, which in the aggregate, form the celebrated Elk Mountain range of Central Colorado, seem to have been originally thrust up through the overlying Cretaceous and Tertiary beds with the utmost irregularity, producing a series of faults and overturnings of strata, equalled in very few localities on this continent. Teocalli mountain does not present the appearance of having been eroded since the uplift, and the vast

thickness of superincumbent strata may have been removed prior to its elevation, but we know that at least 10,000 feet of more modern beds, at one period rested upon it. The illustrations accompanying this paper will serve to convey some idea to the reader of the unique scenery which abounds in the mountain regions of Central Colorado.

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A SKETCH OF THE PROGRESS OF BOTANY IN THE UNITED STATES IN THE YEAR 1879.

BY PROF. C. E. BESSEY.

A. Anatomy and Physiology.—In this department the observations of the botanists of this country, as shown by their published papers, were directed mainly to the reproductive organs and their functions; and with one or two exceptions the papers were short, involving but a few quickly-made observations. Little or no work was done in micro-anatomy (histology) and proper physiology.

While we may regret that so much of the field has been so sadly neglected in our country, we should remember, that as a rule our botanists are overloaded with other duties which render it often impossible for them to command the time for making the necessary investigations.

In the January number of the *NATURALIST*, Prof. J. E. Todd published a paper "On Certain Contrivances for Cross-fertilization in Flowers," illustrated by eight wood-cuts, in which he described the modes of pollination in *Martynia*, *Penstemon* and *Lobelia*, and added a few observations upon the structure of the Iris flower. In the same journal Mr. William Trelease published (p. 427) a paper "On the Fertilization of several species of *Lobelia*," and another (p. 688) on "The Fertilization of our native species of *Clitoria* and *Centrosema*," both illustrated by several cuts. Thomas Meehan's paper "On the Fertilization of *Yucca*," read before the American Association for the Advancement of Science, is interesting from the fact that it shows that in *Yucca*, where we appear to have so perfect an adaptation of flower and insect (*Pronuba yuccasella*), pollination may still be effected by other and unusual means.

Prof. W. J. Beal described in the *American Journal of Science and Arts* for May, some "Experiments in Cross-breeding plants